Borovskiy, I.B. [IMET AN SSSR (Institute of Metallurgy imeni A.A. Baykov AS USSR)]. New Method of Studying the Composition of Microvolumes of a Substance 81

Rzhanov, A.V. [FIAN (Physics Institute imeni P.N. Lebedev, Academy of Sciences USSR)]. Electrophysical Method of Determining Microimpurities in Semiconductors 95

Kupriyanov, S.Ye. [FKhI imeni L.Ya. Karpova]. Use of an MS-1 Mass Spectrometer in Analysis of Inert Gases and Determination of Small Quantities of Impurities in Them 104

Ormont, B.F. [FKhI imeni L.Ya. Karpova]. Concerning the Problem of Standardizing the Characteristics of High-Purity Semiconductor Materials 108

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SMAGINA, Ye.I.; KUTSEV, V.S.; ORMONT, B.F.

Study of the equilibrium in the system zirconium - nitrogen at high temperatures, and the free energy of formation of ZrN_x as a function of the composition and structure of this system. Probl.fiz.khim. no.2:118-131 '59. (MIRA 13:7)

1. Laboratoriya kompleksnykh i tverdykh soyedineniy Nauchno-issledovatel'skogo fiziko-khimicheskogo instituta imeni L.Ya.Karpova.

(Zirconium nitride) (Nitrogen)

18(6) SOV/78-4-6-31/44

AUTHORS: Epel'baum, V. A., Gurevich, M. A., Ormont, B. F.

TITLE: On the Nature of the α- and β-phase Which Are Formed in the System Boron-carbon (O prirode α- i β-faz, obrazuyushchikhsya v sisteme bor-uglerod)

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 6, pp 1398 - 1403 (USSR)

ABSTRACT: The conditions for the formation of the α- and β-phase in the system boron-carbon were investigated. Boron with a purity of 99.6% produced by the thermal dissociation of borane and carbon of a purity of 99.8% were used as initial products. The alloy was produced either in an argon atmosphere or in vacuum 10^{-3} torr at 1900 - 2200°, and in vacuum 10^{-3} torr at 1150°, then stored for 10 hours at this temperature, and then stored 21 hours in an argon atmosphere at 1350°. Then the alloy was again heated and stored for three hours at 2300°. Table 1 shows the results of the chemical- and X-ray phase analyses of several preparations which were produced from purest initial products and purest boron anhydride. The X-ray phase analysis showed that beside the line of the initial

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boron nitride also intensive lines of the α- and β-phase occur in the products. The α-phase is coarse-grained, the β-phase fine-grained. The influence of the thermal treatment of the boron carbide- B_4C - samples on the ratio of the α- and β-phase was investigated as well as the graphite phase (Table 2). The results showed that a change of the ratio in the lines of the α- and β-phase occurs in the case of the thermal treatment in a Tammann furnace after the hot press method and in the furnace TVV-2. A mutual transformation of the α- and β-phase takes place in the temperature range 1900 - 2200°. The lattices of the β-phase were more accurately determined and the average value a= 3.161±0.004 kX was detected. There are 2 tables and 5 references, 3 of which are Soviet.

SUBMITTED: March 27, 1958

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5(4).

AUTHOR: Ormont, B. F. SOV/78-4-9-41/44

TITLE: On the Influence of Polarization on the Width of the "Forbidden" Zone of Semiconductors

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 9, pp 2174-2175 (USSR)

ABSTRACT: In March 1958 the author published a paper (Ref 4) in which the principles were formulated which relate the width ΔE of the forbidden zone (FZ) of semiconductors to the solidity, type of chemical bond, and other physical constants. Some results were given in the paper (Ref 5) submitted in June 1958. The author repeats the following formulations: the width of the FZ of a semiconductor must be proportional, under otherwise equal conditions, to a certain power n of the quantitative ratio of the effective nuclear charges (charges of the atom residues) of the atoms participating A and B, i.e. $\left(\frac{V_B}{V_A}\right)^n$. Among analogs

Card 1/2 with an identical sum total of atomic numbers and an equal ratio

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V_A/V_B the greatest ΔE is to be found, in the case of the same differences in electronegativity, with the analog having the smallest "cation" and largest "anion", i.e. with a maximum polarization of the latter. The author states that the paper by O. Folbert (Ref 7), which was printed shortly after his own, does contain a number of correct conclusions, but, on the other hand, some statements with which the author cannot find himself in agreement. There are 1 figure and 8 references, 5 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: February 7, 1959

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5(4)

AUTHOR: Ormont, B. F. SOV/78-4-9-42/44

TITLE: On the Width of the Forbidden Zone of the Series of $A^{III}B^{V}$ Compounds

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 9, pp 2176-2177 (USSR)

ABSTRACT: On the basis of the equations derived in reference 1 the author points to the possibility of estimating the values for the width of the forbidden zone of some compounds of the type $A^{III}B^{V}$ (Table 1), which have partly not yet been investigated nor even discovered. The table contains values for the known compounds AlN, AlP, GaN, InN as well as for the compounds BP, BAs, BSb, BBi, TlN and TlP which have so far not been investigated or described. Some of the latter compounds might prove to be thermodynamically unstable. There are 1 table and 8 references, 5 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: February 26, 1959

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5(2)

SOV/78-4-10-19/40

AUTHOR: Ormont, B. F.

TITLE: On Phases of Variable Composition in the Crystallo-chemistry of Semi-conductors

PERIODICAL: Zhurnal neorganicheskoy khimii, 1959, Vol 4, Nr 10, pp 2295 - 2303 (USSR)

ABSTRACT: This paper was read at the Plenary Meeting of the Second All-Union Conference for Crystallo-chemistry (March 26, 1957). The author emphasized the specific property of semi-conductors, to response to smallest changes in composition, lattice defects and energy. Whereas the physico-chemical analysis puts up in the construction of phase diagrams with an error of $10^{-2}\%$, the investigation of semi-conductors indicates phases of variable composition which react to a change of the impurity content in the order of from 10^{-6} - $10^{-8}\%$. Whereas for the ultramicroanalysis a microgram is considered a measure useful in practice, the chemistry of semi-conductors will have to operate with the picogram. The author divides the phases of variable composition into three classes: Class A up to $10^{-2}\%$ impurities, detectable with ordinary methods of analysis; class B up to $10^{-6}\%$ im-

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purities, chemically detectable by means of tagged atoms, and class C up to $10^{-10}\%$ impurities, the detection of which requires the creation of a new investigation field, the ultramicroanalytical physics. The phase diagram of semi-conductors needs in certain zones considerable enlargement of scale as it was used by J. Bloem and F. Kroeger (Ref 8), and in a modification by the author (Ref 14). It is characteristic of the phase diagram of semi-conductors that instead of compounds (phases) with constant composition compounds with variable composition occur. If the compound which forms the phase is inside a range of homogeneity, it is termed daltonide, if it lies outside, berthollide. (Abstracter's note: The second name is derived from Berthollet). The crystallo-chemistry of semi-conductors first assumed that the properties of semi-conductors are determined by the periodicity of the long range order in the crystal. Since, however, A. R. Regel' and other Soviet workers detected properties of semi-conductors in glasses, A. F. Ioffe concluded, that a quantum theory has to be developed for the semi-conductors independent of their crystal structure. In semi- conductors the short range

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order is determining. The influence of the quantum characteristic of the substituting elements is mentioned: Substitution of sp-elements by homologs (ZnSe-CdSe); by sp-elements of other sub groups (ZnS-PbS) and by ds-elements (ZnSe-MnSe). There are phase transitions and new phases occurring under abrupt variation of the properties. This sensitivity of semi-conductors to the concentration of impurities is the reason for the difference between semi-conductors which were produced under apparently analogous conditions. The investigation of semi-conductors can only be possible by combined investigation of the correlations between the thermodynamic, electrophysical and mechanical properties. In order to combat the widely used separation of the structural from the thermodynamic investigation, in the institute mentioned in the Association, heterogeneous equilibria at temperatures up to 3000°K under a combined investigation of structure and properties were investigated. The author concludes in the conviction to be close to the solution of this problem. There are 3 figures and 25 references, 16 of which are Soviet.

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ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova Akademii nauk SSSR (Physico-chemical Institute imeni L. Ya. Karpov of the Academy of Sciences, USSR)

SUBMITTED: July 24, 1958

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5(4)

AUTHORS: Smirnova, V. I., Ormont, B. F. SOV/76-33-4-4/32

TITLE: On the Determination of the Surface Tension at High Temperatures **by the Pendant and Creeping-Drop Methods**
(Ob opredelenii poverkhnostnogo natyazheniya pri vysokikh temperaturakh metodami visyachey i natekayushchey kapli)

PERIODICAL: Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 4, pp 771-779 (USSR)

ABSTRACT: The surface tension σ of high-melting substances must be determined at high temperatures near the melting point. Therefore, in selecting the devices and the methods of measurement the increased reactivity of the test substance (to the material of the device and the environment) must be taken into consideration. In the present case two methods of determination are discussed. Besides other deficiencies of the measuring method of **pendant** drop (Ref 5) it is found that the following completions must be made: 1) the error which occurs in the transitior from the computation equation (4) into the reduced form (5) (Ref 4) must be eliminated. 2) A special apparatus must be used which eliminates a reaction of the preparation with the environment. 3) The errors which occur due to the formation of the drop which is not completely in equilibrium must

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On the Determination of the Surface Tension at High Temperatures by the Pendant and Creeping-Drop Methods

be avoided. Ad 1) two correction factors are introduced into the equation (4), a new equation is derived and the corresponding data for K, Na, Sn, Mg, Ag, Au, Cu, Fe are given (Table 1). Ad 2) experiments on the thickness of sample were carried out for the determination of σ with Sn, Bi, Ag, Au, Cu, Ni, Fe and the values are tabulated (Table 2). The determinations of σ in Sb and Bi at the melting temperature were carried out in a glass vessel (Fig 2) on heating in a glycerin- (or air-) bath in an argon atmosphere. The measurements of the σ of high-melting metals were conducted in another apparatus (Fig 4) on heating with an electric high frequency furnace. The temperature was determined by means of an optical pyrometer. Data on the behavior of the sample (Ag, Au, Cu, Ni, Fe) as a function of the diameter of the sample are mentioned (Table 3). The experimental results show that the method of the pendant drop may be used also for high-melting metals. Experiments according to the method of the creeping drop were carried out by means of various cameras ("Exacta", "Robot", "Robot-Royal" and "Start"), as well as of motion picture

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cameras. A combination of this method with that of the creeping drop is further investigated. There are 5 figures, 3 tables, and 9 references, 5 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova, Moskva (Physico-chemical Institute imeni L. Ya. Karpov, Moscow)

SUBMITTED: July 26, 1957

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5 (4)

SOV/76-33-7-2/40

AUTHOR: Ormont, B. F.

TITLE: Atomization Energies and Heats of Formation of Some Carbides and Nitrides and the Most Probable Values of Dissociation Energy of Nitrogen and of Sublimation Energy of Carbon

PERIODICAL: Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 7, pp 1455-1460 (USSR)

ABSTRACT: The importance of the function of atomization energy Ω f = comparing the chemical and mechanical strength of solids with a chemical bond near the covalent was already indicated (Ref 3a). The author investigated here the applicability of Ω to problems concerning the reliability of experimental data on the sublimation energy (SE) of carbon and metals as well as the dissociation energy (DE) of nitrogen (I) and the formation enthalpy of some compounds of various homologous series oxide nitride-carbide (for titanium, vanadium, and their homologs). The values Ωp,298 of binary carbides, nitrides, and oxides with MX-composition of Ti, Zr, Hf, V, Nb, Ta, and W in kcal/mol are listed (Table 1) together with data necessary for calculating these values. The author points out that the thermal effects occurring during the formation of the oxides, nitrides, and

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Atomization Energies and Heats of Formation of Some SOV/76-33-7-2/40
Carbides and Nitrides and the Most Probable Values of
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carbides diminish in the case of the same element from the oxide to the carbide; on the other hand, hardness is strengthened and the value Ω increases. By comparing the values of Ω with the specific surface energy ε_{hkl}, the author determined the most probable values of the (DE) of (I) D_N, of the (SE) of carbon S_C, of the thermal effect at constant pressure Q_p, and of the (SE) of the metals S_M. Furthermore, he compared the most probable values of $\Omega_{p,298}$ for the carbides and nitrides (Table 2). He pointed out that there was no linear dependence between Ω and ε_{hkl} in the substances under investigation (as was indicated in (Ref 3)). This problem will later be dealt with. There are 2 tables and 32 references, 5 of which are Soviet.

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Atomization Energies and Heats of Formation of Some Carbides and Nitrides and the Most Probable Values of Dissociation Energy of Nitrogen and of Sublimation Energy of Carbon SOV/76-33-7-2/40

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova, Moskva (Physical and Chemical Institute imeni L. Ya. Karpov, Moscow)

SUBMITTED: December 14, 1957

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5(4)

SOV/76-33-9-16/37

AUTHORS: Zhelankin, V. I., Kutsev, V. S.~~, Ormont, B. F.~~

TITLE: Investigation of Equilibrium in the Reaction of the Reduction of Hafnium Dioxide by Carbon at High Temperatures

PERIODICAL: Zhurnal fizicheskoy khimii, 1959, Vol 33, Nr 9, pp 1988-1991 (USSR)

ABSTRACT: In spite of the fact that hafnium carbide is one of the highest melting compounds (3890°C), and is therefore of special interest, there are no data in publications concerning the equilibrium in the system $HfO_2 - C - CO - HfC_xO_y$. Investigation was made of the reduction reaction of HfO_2 with graphite in the temperature range 1743-2003°K at a pressure of 70-1000 torr, by means of an electrical vacuum furnace (Ref 10). Temperature was measured with an optical pyrometer of type OPPIR-45 which was calibrated with a standard lamp designed by G. S. Popov. Pressure of the carbon monoxide was measured with a mercury gauge with the aid of a microscope. Equilibrium values of pressure and respective temperatures are given (Table) as well as the X-ray line patterns (Fig 4). As may be observed from the latter, the following phases are found in equilibrium: carbide

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phase (cubic face-centered lattice), HfO_2 (monoclinic lattice), graphite and CO. The lattice periods of carbide are the following: $a = 4.627_2$ kX for 2003°K and $a = 4.626_6$ kX for 1743°K. The reaction by which the equilibrium is brought about is: $HfO_2 + (x-y+2)C \rightleftarrows HfC_xO_y + (2-y)\ CO + Q_p$. From the diagram of lgP as a function of $10^4/T$ (Fig 3), the heat effect of reaction was computed with $Q_p = -132 \pm 3$ kcal for the temperature range 1743-2003°K and $Q_{-p} =$ constant. Further investigations of the carbide phase are in progress. There are 4 figures, 1 table, and 10 references, 4 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute imeni L. Ya. Karpov), Vsesoyuznyy nauchno-issledovatel'skiy institut tverdykh splavov (All-Union Scientific Research Institute of Hard Alloys)

SUBMITTED: February 22, 1958

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5(4), 24(3) SOV/20-124-1-36/69

AUTHOR: Ormont, B. F.

TITLE: On the Dependence Between the Energy-, Electrophysical- and Mechanical Properties of Semiconductors (O zavisimosti mezhdu energeticheskimi, elektrofizicheskimi i mekhanicheskimi svoystvami poluprovodnikov)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 1, pp 129-132 (USSR)

ABSTRACT: In the course of recent years the author discovered a new means of solving this problem. The first part of this paper deals with the dependence between the atomizing energy of the compound, the lattice energy, and the formation enthalpy (Joule heat). It holds that $\Omega = U - \sum_n I - \sum_n E + \alpha$. Here Ω denotes the atomizing energy, $\sum_n I$ - the total ionization potential, $\sum_n E$ the accumulation energy of n electrons, U - the energy of the transition from the ideal Born state of the lattice to the real state. The thermodynamic strength of the lattice is described more accurately by the atomizing energy Ω, if the lattice is essentially an atomic

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lattice, and by the lattice energy U, if the bonds are similar to the ion bonds. For the connection of the specific surface energy ε_{hkl} with the atomizing energy Ω $\varepsilon_{hkl} = (\Omega/a^2)\, M_{\varepsilon(hkl)}$ erg/cm^2 holds, where $M_{\varepsilon(hkl)}$ is the structure constant of the surface energy. The specific free surface energy σ_{hkl} can be calculated from ε_{hkl} according to the relation $\sigma_{hkl} = \varepsilon_{hkl} + T\,\partial\sigma/\partial T$. In an earlier paper (Ref 7) as well as in the present paper the author calculated the values of ε_{hkl} for several semiconductors having the structure of a diamond and zinc blende, comparing them with the experimental values of microhardness. The correct correlation exists between these values. In the next part of the paper the dependence of the width of the forbidden zone of some semiconductors upon the strength and the character of the chemical bond is discussed. The width of the forbidden zone of a semiconductor must, with conditions

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otherwise being equal, be proportional to the ratio of the effective charges of the nuclei (atomic trunks). There are 11 references, 10 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-Chemical Institute imeni L. Ya. Karpov)

PRESENTED: June 18, 1958, by P. A. Rebinder, Academician

SUBMITTED: June 18, 1958

Card 3/3

87905

S/181/60/002/012/005/018
B006/B063

9.4300 (1143, 1155)

AUTHORS: Godik, E. E. and Ormont, B. F.

TITLE: Application of the Method of Diffuse Reflection Spectra for Determining the Width of the Forbidden Band ΔE_{phot} in Powdery Samples

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 12, pp. 3017-3019

TEXT: The spectra of diffuse reflection from the phases and the binary system $(ZnSe)_x-(CdSe)_y$ have been studied and were used to determine the forbidden-band width ΔE_{phot}. Measurements were made with an СФ-2М(SF-2M) spectrometer in the visible region. The samples were prepared by mixing the powders and grinding it to a paste together with cellulose nitrate varnish or alcohol. Powders without additions were also examined. MgO was used as standard substance. First, the fundamentals of ΔE_{phot} determination from diffuse reflection spectra were analyzed, i.e., the dependence of results upon the degree of dispersion, the thickness of the

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87905

Application of the Method of Diffuse Reflection Spectra for Determining the Width of the Forbidden Band ΔE_{phot} in Powdery Samples

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B006/B063

layer, the reflectivity of the base, and the adhesiveness of the substance was studied. Experiments were made with ZnSe, $(ZnSe)_{0.7}\cdot(CdSe)_{0.3}$, and $(ZnSe)_{0.5}\cdot(CdSe)_{0.5}$, and indicated that the experimental conditions scarcely influence the results. For comparison, ΔE_{phot} was determined from the diffuse reflection spectra (1), the spectra of the capacitor photo-emf (2), the spectra of transmitted light of suspensions (3), and from sputtered films (4). For ZnSe, e.g., ΔE_{phot} was found to be 2.64 ev according to (1), 2.66 ev according to (3), and 2.67 ev according to (2). Method (1) yielded results of good reproducibility. Values of ΔE_{phot} obtained by method (1) for various compositions of the system concerned and results concerning ΔE_{phot} as a function of the composition were published in Ref. 3. At the same time, similar studies have been made at FTI (Institute of Physics and Technology) by B. T. Kolomiyets and Lin' Tszin'-tin' (Ref. 4), which yielded consistent results. All this indicates that method (1) is suitable for determining ΔE_{phot}. The sensitivity of

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B006/B063

method (1) to the phase composition has been studied as well. It was found that it may also be used for a quick and exact phase-shift analysis of semiconductors. There are 2 figures and 4 references: 2 Soviet, 1 British, and 1 German.

SUBMITTED: April 15, 1960

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5(2) SOV/78-5-1-38/45

AUTHORS: Chizhikov, Yu. N., Kutsev, V. S., Ormont, B. F.,
Morzheyedova, R. N.

TITLE: A Method Used to Investigate the Differential Thermoelectromotive Force at High Temperatures

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol 5, Nr 1,
pp 224-225 (USSR)

ABSTRACT: The authors point out that only methods used to measure the temperature coefficient α of the thermoelectromotive force have been described in publications which are applicable up to 1500°K. They describe a method permitting measurement up to 2000°K. The substance to be tested is clamped between two holders which do not enter into chemical reaction with the substance at the test temperatures T_1 and T_2 (e.g., graphite). Pt-PtRh thermocouples are attached to the holders, which are outside the hot zone and do not react with the holder material at the temperatures t_1 and t_2 to which they are subjected. The device is shown in figure 1. The thermoelectric potential was measured by means of a recording potentiometer (type EPP-09).

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A Method Used to Investigate the Differential Thermoelectromotive Force at High Temperatures

Next, an equation is derived for the dependence of α on t_1, T_1 and t_2, T_2. Experimental results obtained with tungsten carbide within the range 1400-1900°K are compared in figure 2 with data of publications concerning the range 500-1400°K. There are 2 figures and 4 references, 3 of which are Soviet.

SUBMITTED: May 26, 1959

Card 2/2

5.4130
5.4110
~~5(2)~~

68123
SOV/78-5-1-45/45

AUTHORS: Zherdev, Yu. V., Ormont, B. F.

TITLE: On the Dependence of the Forbidden Zone of Phases in the System ZnSe - CdSe on Structure and Composition

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol 5, Nr 1, p 239 (USSR)

ABSTRACT: The authors were interested in the system ZnSe - CdSe because the phase transition from the structure of the sphalerite type to the wurtzite type takes place in it in which only the long-range order of atoms varies whereas the tetrahedral short-range order is not affected. The authors investigated ZnSe and CdSe which are used for the production of luminophores and contained impurities of the order of $10^{-3} - 10^{-4}$%. The width ΔE_F of the forbidden zone (between the cubic and the hexagonal structure region) was determined from the spectra of absorption and diffused reflection as well as from the dependence of the logarithm of conductivity upon the reciprocal temperature value (ΔE_T). The ZnSe - CdSe mixtures were sintered at 1060^{C} in quartz ampoules. The phases of the preparations were examined by means

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of an X-ray spectroscope. The spectra of absorption and diffused reflection were taken by means of SF-4 and SF-2 spectrophotometers. The values of ΔE_F obtained from the two spectra are in good agreement (Fig). ΔE_F varies continuously with changed composition from 2.66 ev for ZnSe to 1.72 ev for CdSe. ΔE_T drops from 2.65 ev for ZnSe to 0.68 ev for CdSe with a distinctly marked break. The slope of the gradient is steeper in the sphalerite region. In the wurtzite region, ΔE_T runs almost in parallel with ΔE_F with a difference of about 0.9 ev, whereas in the sphalerite region the difference increases from zero for ZnSe to 0.7 ev at the interface. The various possibilities of interpreting these phenomena are at present being studied by the authors. It is assumed that ZnSe has a stronger covalent linkage than CdSe. There is 1 figure.

SUBMITTED: August 11, 1959

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5.4130
~~5(2), 5(4)~~

68218
S/078/60/005/02/004/045
B004/B016

AUTHOR: Ormont, B. F.

TITLE: On the Dependence of the Width of the Forbidden Zone of Electronic and Electronic-nuclear Analogs of Germanium on Stability and Nature of Chemical Bonds 21

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol 5, Nr 2, pp 255-263 (USSR)

ABSTRACT: On the basis of his previous papers, the author first presents a summary of his concepts regarding the relationship between the energetic and electrophysical properties of solids, especially of semiconductors. He mentions the principles already published by him including the following: The width of the forbidden zone is, under otherwise equal conditions, proportional to the ratio of the effective nuclear charges: $(\frac{V_B}{V_A})^n$. The exponent n was experimentally determined to be 1.2 (Refs 4,6). To calculate the width ΔE of the forbidden zone, the equations (1) - (6) were derived. The author now investigates the behavior of the electronic and electronic-nuclear

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On the Dependence of the Width of the Forbidden Zone of Electronic and Electronic-nuclear Analogs of Germanium on Stability and Nature of Chemical Bonds

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analogs of germanium. He defines the analog as a substance with the same number of valence electrons and same orbital quantum numbers. In compounds, the analogous structure is defined as a structure with the same syngony, same number and position of atoms in the unit cell (Fig 1 : comparison of the unit cell of the diamond with that of sphalerite). Compounds with equal summational atomic number ΣZ are designated as electronic-nuclear analogs (GeGe: $\Sigma Z = 32 + 32 = 64$; GaAs: $\Sigma Z = 31 + 33 = 64$; InP: $\Sigma Z = 49 + 15 = 64$, etc). Horizontal analogs are compounds the components of which belong to the same period of the periodic system (GeGe, GaAs), diagonal analogs are such compounds the components of which belong to different groups and periods (InP), in vertical analogs the components belong to different periods but to the same group (SiSn). The following manner of representation is suggested: GeGe: $(4^{IV} \ast 4^{IV})$, GaAs: $(4^{III} \leftarrow 4^{V})$, ZnSe: $(4^{II} - 4^{VI})$; AlSb: $(3^{III} \searrow 5^{V})$,

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B004/B016

InP: (5^{III} / 3^{V}), CSi: (2^{IV} / 3^{IV}). In figure 2, the dependence of ΔE on $(\frac{V_B}{V_A})^n$ for the compounds $A^{III}B^{V}$ is shown. In table 1, the values of ΔE and $(\frac{V_B}{V_A})^{1.2}$ of the compounds of type $A^{IV}A^{IV}$, $A^{III}B^{V}$, and $A^{II}B^{VI}$ are compared with one another. Table 2 gives 38 simple substances AA, solid solutions AB, and compounds AB. Up to ΣZ = 108, these compounds (partly not yet described) may possess semiconductor properties. At $\Sigma Z > 108$ (e.g. TlAs), a special investigation will be necessary. For the substances up to ΣZ = 100, table 3 gives the data in detail, and discusses them. The experimental data of the known compounds are found to agree with theory. Other compounds still unknown such as InN, are at present being investigated in the author's laboratory. In the case of the phase transition wurtzite-sphalerite, an experimental investigation of the change of ΔE will be required. There are 2 figures, 3 tables, and 19 references,

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On the Dependence of the Width of the Forbidden Zone of Electronic and Electronic-nuclear Analogs of Germanium on Stability and Nature of Chmeical Bonds

S/078/60/005/02/004/045
B004/B016

15 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Institute of Physical Chemistry imeni L. Ya. Karpov)

SUBMITTED: February 3, 1959

Card 4/4

KUTSEV, V.S., ORMONT, B.F., CHIZHIKOV, Yu.N., MORZHEYEDOVA, R.N.

Method of investigating the differential thermo-emf at high temperatures. Zhur. neorg. khim. 5 no.4:891-893 Ap '60. (MIRA 13:7)

1. Fiziko-khimicheskiy institut im. L.Ya. Karpova.
(Electromotive force) (Thermoelectricity)

S/078/60/005/05/20/037
B004/B016

AUTHORS: Trusova, V. P., Kutsev, V. S., Ormont, B. F.

TITLE: The Range of Homogeneity of Chromium Disilicide and Its Electrical Properties

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 5, pp. 1119-1122

TEXT: The authors have previously investigated the electrical properties of several silicides of the metal period Ti - Ni and studied the composition $CrSi - CrSi_{2.5}$ by means of chemical and X-ray analysis. The silicide was synthesized in evacuated quartz ampuls at 1100 - 1050° with subsequent slow cooling. The composition of the compound was determined after melting with soda by gravimetric analysis of SiO_2 and iodometric analysis of Cr (Table 1). The X-ray analysis was made by means of an RKU-114 camera, a BSV tube, as well as by means of the URS-50I apparatus. The line spacings were measured on an IZA-2 comparator. Table 2 lists the data of X-ray analysis, and Fig. 1 shows the corresponding X-ray pictures. The CrSi lines appear only in preparations with a composition below $CrSi_{1.95}$. The disilicide has a range of homogeneity of between $CrSi_{1.99}$ and $CrSi_{2.29}$. The lattice constants are $a = 4.421 \pm 0.002$ kX, $c = 6.35 \pm 0.01$ kX, and

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The Range of Homogeneity of Chromium Disilicide and Its Electrical Properties

S/078/60/005/05/20/037
B004/B016

agree with Ref. 15. In the range of homogeneity the coefficient of the thermo-electromotive force and its temperature dependence were measured. The measuring apparatus were supplied by Ye. I. Smagina and Yu. V. Zherdev, the measurement was carried out by Yu. N. Chizhikov. Fig. 2 shows the temperature dependence of electrical conductivity obtained by the authors, and, for comparison, also the data of Ref. 3, 4. CrSi$_{1.99}$ and CrSi$_{2.29}$ show the same course of electrical conductivity in spite of different composition. There are 2 figures, 2 tables, and 5 references, 4 of which are Soviet.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Institute of Physical Chemistry imeni L. Ya. Karpov)

SUBMITTED: January 28, 1959

Card 2/2

Ormont, B F

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S/078/60/005/008/007/016
B004/B052 82326

AUTHORS: Zherdev, Yu. V., Ormont, B. F.

TITLE: The Dependence of the Width of the Forbidden Band in the System ZnSe - CdSe on Structure and Composition

71

PERIODICAL: Zhurnal neorganicheskoy khimii, 1960, Vol. 5, No. 8, pp. 1796-1799

TEXT: For an introduction, the authors discuss the influence of short range order, long range order, binding energy, and extension of the homogeneity range of the modification taking part in the phase transition, on the electric properties of semiconductors. The sphalerite - wurtzite-type transition, as observed in sulfides and selenides of Zn, Cd, Mn, etc, is given special attention. Since the investigation of the temperature dependence of the conductivity is difficult in the case of thermodynamically unstable modifications, the authors chose the pseudobinary system ZnSe - CdSe for their investigation. The phase transition in this system only depends on the composition and is not

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The Dependence of the Width of the Forbidden Band in the System ZnSe - CdSe on Structure and Composition

S/078/60/005/008/007/018
B004/B052 82326

influenced by impurities. The preparations were produced from high purity ZnSe and CdSe (content of Fe, Ni, Co, and Cu: $10^{-4}\%$), partly by sintering in evacuated quartz ampuls (10^{-3} torr) at 1060°C (20 h), partly by sintering in selenium vapor ($P_{Se} \approx 1.5$ torr). The temperatures were kept constant by means of an ЭПВ -01 (EPV-01) thermoregulator. The samples produced by these two methods showed no difference in their electric properties. Radiographs of the samples were taken by means of fine focus tubes designed by B. K. Lemazhikhin in the Institut biofiziki AN SSSR (Institute of Biophysics of the AS USSR), and the РКУ-114 (RKU-114) camera, or by means of a УРС-50и (URS-50i) X-ray diffractometer. The data of the analysis are given in a Table and in Fig. 1. At a sintering temperature of 1060°C, the homogeneity range of the sphalerite modification lies between 0 and 30.7 atom% of CdSe, that of the wurtzite-type modification between 33.4 and 100 atom% of CdSe. At the boundary of the homogeneity range, the value of the lattice constant for pure ZnSe rises from 5.656 A to 5.790 A, then drops to 4.081 A during the phase transition, and for pure CdSe it rises again to 4.285 A. The

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The Dependence of the Width of the Forbidden Band in the System ZnSe - CdSe on Structure and Composition

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ratio of c/a remains almost constant. The curve of the interatomic distance d, as function of the composition, shows no bend in the phase transition. The specific conductivity σ was measured by a ППТВ/I (PPTV/I) potentiometer. Fig. 2 shows the curve log σ = f(1/T) for the cubical structure, Fig. 3 the same function for the hexagonal structure, and Fig. 4 shows ΔE_T, the width of the forbidden band as function of the composition. ΔE_T drops from 2.65 ev (pure ZnSe) to 1.50 ev (boundary of the homogeneity range). In the wurtzite-type range, the reduction from 1.40 ev to 0.68 ev (pure CdSe) takes place more slowly. Any possible deviations from the stoichiometrical composition of ZnSe and CdSe were not taken into consideration in the evaluation of the experimental data. There are 4 figures, 1 table, and 14 references: 12 Soviet, 1 US, and 1 German.

SUBMITTED: February 7, 1959

Card 3/3

BREGER, A.Kh.; ORMONT, B.F.; VITING, B.I.; GRIZHKO, V.M.; KOZLOV, V.A.;
KUTSEV, V.S.; CHAPYZHNIKOV, B.A.; CHEPEL', L.V.

Radioactivation method of determining oxygen in semiconducting materials and metals on the basis of the photonuclear reaction $O^{16} (\gamma,n) O^{15}$. Trudy kom.anal.khim. 10:137-141 '60. (MIRA 13:8)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova, Moskva.
(Oxygen--Analysis)
(Oxygen--Isotopes)
(Semiconductors--Oxygen content)

GODIK, E.E.; ORMONT, B.F.

Applicability of the method of diffuse reflection spectra to the determination of the width of the prohibited zone E phot. of powdered samples. Fiz. tver. tela 3 no. 12:3017-3019 D '60.
(MIRA 14:4)

(Zinc selenide) (Cadmium selenide)

S/076/60/034/06/26/040
B015/B061

AUTHORS: Smirnova, V. I., Ormont, B. F. (Moscow)

TITLE: High Vacuum Quartz Furnace With Rotating Membrane for Determining Surface Tension at High Temperatures and Other Investigations

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 6, pp. 1316-1319

TEXT: A method of investigating the surface tension of solid bodies at the melting point was described previously (Ref. 2). The apparatus then used for determinations up to 2000°C are described here in greater detail. High vacuum furnaces with a rotating quartz 15 membrane which is heated by resistance- or induction-heating elements are concerned. Types of apparatus of this nature are described: a furnace with induction heating elements for determining surface tension of solids up to 2000°C at low vapor pressure (Fig. 1); a furnace with induction heating and a spring balance for determining the reaction rate from the loss of weight, and especially for determining the atomization energy (Fig. 2); and a

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18.1200 2708, 2808, 2308

S/076/60/034/010/017/022
B015/B064

AUTHORS: Smagina, Ye. I., Kutsev, V. S., Ormont, B. F.

TITLE: Investigation of Equilibrium in the System Zr - N at High Temperatures

PERIODICAL: Zhurnal fizicheskoy khimii, 1960, Vol. 34, No. 10, pp. 2328-2335

TEXT: Investigations of the reaction between zirconium and nitrogen at high temperatures are important since zirconium has recently much been used as a construction material. In recent papers, e.g., by Hoch et al. (J.Amer.Chem.Soc., 77, 304, 1955) the metal nitrides are wrongly regarded as phases of constant composition. In the present case, the nitride equilibrium of zirconium nitrides was investigated at temperatures of up to 2800°K. A vacuum furnace described in Ref. 8 was somewhat modified and the experiments carried out in it; special attention was paid to chemical and X-ray analyses to check the changes in the nitride phase. The temperature in the vacuum furnace was measured with an optical ОППИР-45 (OPPIR-45) pyrometer, calibrated for an ЛТ-2 (LT-2) standard lamp

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designed by G. S. Popov. Pulverized zirconium nitride (and not metallic zirconium) served as initial product. The equilibrium in the system Zr - N was statically established by filling, at T = const, the vacuum furnace with nitrogen until a pressure of 0.5 - 1 atm had been reached. The initial zirconium nitride having a composition from $ZrN_{0.6}$ to $ZrN_{0.8}$ absorbed the nitrogen quickly, and after 30 minutes equilibrium was established. The effect of the equilibrium pressure upon the composition at T = const was investigated by applying various initial pressures and subjecting the preparation to chemical and X-ray analyses. In another test series, nitrogen was investigated by Kjeldahl's semimicro-method, zirconium gravimetrically, and the phase composition by X-ray analysis; for this purpose a УРС-50И (URS-50I) X-ray diffractometer was used. The experimental results obtained for 2100°-2750°K and approximately 10^{-1} to 100 mm Hg show different equilibrium compositions of ZrN_x. To check the composition more accurately, the course of the curve "equilibrium - composition" was investigated for the range 10 - 300 mm Hg, where a slight change was found to exist. The experimental results (Table 1) show that equal equilibrium compositions of the nitrides are obtained

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Investigation of Equilibrium in the System
Zr - N at High Temperatures

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irrespective of the fact whether nitrides rich or poor in nitrogen are taken as a basis, if the same temperature and pressure were maintained. This may be regarded as a proof that true equilibrium has been attained for the given pressure and temperature. The data of the X-ray phase-shift analysis show that all preparations were single-phase nitrides ZrN_x with cubic face-centered lattices, and that with a change of x between 0.7 and 0.96 the lattice period is between 4.577 and 4.584 A. Contrary to Ref. 1, it was found that in equilibrium the phases ZrN_x - N_2 coexist, and not ZrN, Zr_{solid} and N_2. A table gives the equilibrium compositions as a function of temperature and pressure. There are 6 figures, 3 tables, and 13 references: 4 Soviet, 5 US, and 4 German.

Legend for the Table: Dependence of equilibrium compositions of zirconium nitrides on temperature and pressure, 1 = formula of initial product, 2 = T, K^o of furnace (true), 3 = equilibrium pressure, mm Hg, 4 = formula of final product according to chemical analysis, 5 = lattice period, A, 6 = nitride with low nitrogen content, 7 = dto.

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Таблица 1

Table 1

Зависимость равновесных составов нитридов циркония от температуры и давления

1 Формула исходного продукта	2 T, °K печи (истинная)	3 Равновесное давл., мм рт. ст.	4 Формула конечного продукта по хим. анализу	5 Период решетки, Å
6 Нитрид с низким содержанием азота	2133	13,0	$Zr_1N_{0,924\pm0,02}$	4,577
$Zr_1N_{0.937}$	2148	$1,5\cdot10^{-1}$	$Zr_1N_{0,783\pm0,06}$	4,578
$Zr_1N_{0,935\pm0,01}$	2235	6,0	$Zr_1N_{0,941}$	4,577
$Zr_1N_{0,935\pm0,01}$	2235	6,0	$Zr_1N_{0,918}$	4,578
$Zr_1N_{0,658}$	2235	17,0	$Zr_1N_{0,89}$	4,577
$Zr_1N_{0,804}$	2235	20,0	$Zr_1N_{0,920}$	4,578
$Zr_1N_{0,967}$	2235	105,0	$Zr_1N_{0,905}$	4,577
6 Нитрид с низким содержанием азота	2235	350,0	$Zr_1N_{0,952}$	4,578
$Zr_1N_{0,956}$	2320	11,5	$Zr_1N_{0,911}$	4,577
$Zr_1N_{0,731}$	2350	3,0	$Zr_1N_{0,87}$	4,577
$Zr_1N_{0,935\pm0,01}$	2350	27,5	$Zr_1N_{0,893}$	4,578
6 Нитрид с низким содержанием азота	2353	195,0	$Zr_1N_{0,928}$	4,576

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$Zr_1N_{0,783}$	2448	$2,3\cdot10^{-1}$	$Zr_1N_{0,783}O_{0,1}$	4,582
$Zr_1N_{0,956}$	2455	6,0	$Zr_1N_{0,883}$	4,577
6 Нитрид с низким содержанием азота	2505	12,0	$Zr_1N_{0,883}O_{0,03}$	4,577
6 Нитрид с низким содержанием азота	2505	12,0	$Zr_1N_{0,882}$	4,577
$Zr_1N_{0,898}O_{0,01}$	2545	13,0	$Zr_1N_{0,931}$	4,575
$Zr_1N_{0,935}O_{0,01}$	2700	7,5	$Zr_1N_{0,891}$	4,577
$Zr_1N_{0,935}O_{0,01}$	2750	10^{-1}	$Zr_1N_{0,70}O_{0,02}$	4,584
6 Нитрид с низким содержанием азота	2300	10^{-1}	$Zr_1N_{0,79}O_{0,1}$	
7 То же	2500	10^{-1}	$Zr_1N_{0,78}O_{0,08}$	

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24.7600(1035,1043,1164)

S/576/61/000/000/001/020
E202/E435

AUTHOR: Ormont, B.F.

TITLE: The role of the contemporary structurally thermodynamical representations in the study of semiconductors

SOURCE: Soveshchaniye po poluprovodnikovym materialam 4th Voprosy metallurgii i fiziki poluprovodnikov, poluprovodnikovyye soyedineniya i tverdyye splavy. Trudy soveshchaniya. Moscow, Izd-vo AN SSSR, 1961. Akademiya nauk SSSR. Institut metallurgii imeni A. A. Baykova. Fiziko-tekhnicheskiy institut. 5-17

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TEXT: Following his earlier work in this field (Ref.1 Zh. neorganich. khimii, 1959, 4, 2295 and Ref.2 Symposium "Problems of Physical Chemistry", 1958, 1, 139), the author considers the fundamental thermodynamical approach to the theory of semiconductors. Semiconductors are looked upon as the most general case of the berthollide type of a compound, i.e. a compound with variable composition. In contradistinction from the stoichiometric daltonides, the equilibria of berthollides g

$$MX_{solution}\ (solid) = MX_{(solution - \delta)} + \frac{\delta}{2}X_2\ (gas$$

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depend not only on temperature but also on the composition of t phase $MX_{(solution\ -\delta)}$, within its region of homogeneity. The main object of this highly critical paper is to relate the variable phase compositions, i.e. a thermodynamical con[illegible] crystallographic, structural phenomena such as the various la[illegible] faults and their subsequent physical properties. With this obje[illegible] in mind, the author gives a wide review of the bibliography on this subject. The most revealing classification of semiconductors relates their electrical conductivity σ to the equilibrium pressure of the non metal X over the solid phase $MX_{(1}$ [illegible] $MX_{(1+\delta)}$, denoted by P_X. There are three well defined groups of substances shown (Fig. 1a 1б and 1в 1г) 4

а - are the n-type of semiconductors, where it can be seen that the increase in P_X lowers σ

б - are the substances in which σ is practically independent of P_X;

в - are the p-type of semiconductors in which the increase of P_X increases σ

г - denotes the phases of n- and p-types with PbS as its representative

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The role of the contemporary

The effect of the temperature on the various types of semiconductors is indicated by the arrows. When the temperature T increases, in the case of the n- and p-phases, the straight lines log $P_x = f(\log \sigma)$ are shifted to the right, and the electrical conductivity increases with the temperature. In the case where the lines are vertical the temperature increase may shift the lines either to right or to left. Various structural defects are caused by various types of reactions. The author reviews four typical cases of equilibria, viz

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1) The equilibrium melt-solid, e.g. ZnS-NaCl system. There, the small concentrations of NaCl in ZnS crystals can be evaluated from the Nernst Distribution law.

2) Equilibria in which solid solutions are formed by substitution, which occur in solids when the valencies of the substituting atoms in the lattice are identical, e.g. in the ZnS-CdS system. In this case, the reaction prevents any formation of vacancies in the lattice.

3) Equilibria with the formation of subtractive substitutional solid solutions in which the valency of the lattice atom and the substituting atom are not equal, e.g. the equilibrium of ZnS-$ZnCl_2$ or ZnS-Ag_2S systems

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4) Equilibria crystal-gas, in which there is said to be an oxidation leading to the formation of the acceptor levels, or reduction leading to the formation of the donor levels, e.g. various equilibria existing between the ionic lattice of ZnS and gaseous sulphur.
At this stage the author makes references to his earlier work (Ref.13: Zh. neorg. khimii, 1956, v.1, 1457, Ref.14: Zh. fiz. khimii, 1956, v.30, 1896, Ref.15: with V.I.Smirnova; Dokl. AN SSSR, 1954, v.96, 557, 1955, v.100, 127; Zh. fiz. khim., 1956, v.30, 1327) containing criticisms of numerous contemporary works in which the authors failed to recognise the fundamental importance of the thermodynamical approach. The author disagrees with F.Kröger, H.J.Vink (Ref.5: Halbleiterprobleme red. Schottky 1954, 1, 128) F.Seitz (Ref.6: Modern Theories of Solids, N.Y. 1940); C.Kittel (Ref.7: Introduction to Solid State Physics, 1956, Russian translation Izd-vo AN SSSR, 1957, p.388), J.Bloem and F.Kröger (Ref.8: Z. ph. Ch. Neue Folge, 1956, 7, 1) and particularly with the ionic lattice model according to which both the reduction and oxidation of the phases are equally possible. According to the author one should differentiate between two types
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of phases; viz. the one-sided phases and the two-sided phases. The one-sided phases which may be n(-)- or p(+)- type, can in turn be products of reduction with respect to the stoichiometric composition MX, i.e. occupy the interval between $MX_{1-\delta}$ to MX or almost MX. This will create an n-type phase in a semiconductor. Alternatively, they may be products of oxidation, in which case the interval is MX to $MX_{1+\delta}$, giving a p type phase in a semiconductor. The two-sided phases of variable composition spread on both sides of the stoichiometric composition, i.e. from $MX_{1-\delta}$ to MX to $MX_{1+\delta}$. In thermodynamically determined conditions, the variation of composition will cause the transition n - p or p - n. As can be seen from Fig.1, ZnS has only the n-type phase, FeS only p-type, while PbS has a two-sided phase of variable composition giving rise to the n - p transitions. In practice, the one-sided n- or p-type phases need not necessarily border with the stoichiometric composition, e.g. FeO, in ideal equilibrium conditions and at STP, is said to have a composition $Fe_{0.950}$ and may be oxidized to increase its oxygen content. Similarly, the author and V.S.Kutsev and V.A.Epel baum (Ref.16 Dokl. AN SSSR, 1955, 104, 567; V.I.Zhelankin, V.S.Kutsev and the author

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Zh. neorganich. khimii, 1958 v.3, 1237) found also that ZrC is truly zirconium oxy-carbide, viz. $ZrC_{0.7}O_{0.08}$ and hence 20% of the total carbon atom positions in its lattice remain unfilled. On the basis of the above and similar other considerations, the author states that in the case of a pure semiconductor (i.e. single-sided phase) it is not possible to accomplish at will oxidizing or reducing reactions as envisaged by Kroger since in spite of favourable structural factors there are thermodynamic obstacles preventing such processes from taking place during the formation of free vacancies (holes) and charges. Hence, single-sided phases in practical conditions may be only n-type or p-type in which depending on the equilibrium conditions there may be only a change in the concentration of current carriers but never a change in the sign. The appearance of n- or p-type of phase in a single sided phase is governed simply by the electron valency considerations. The above considerations are used by the author to develop a detailed analysis of the interaction of sulphides with oxygen and then to study the particular cases (see Fig.1) where the curve $\log P_x = f(\log c)$ is vertical. In the last part the author analyses various methods used in relating the electrophysical

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properties of the semiconductors to the thermodynamic and mechanical properties. This leads to the evaluation of the strength of chemical bonds in terms of Ω, the atomization energy of the compounds when the bond is covalent, or semi-covalent or of the metallic type; or U the (Born) energy of the lattice, if the bond is ionic or largely ionic. In the latter case, the evaluation of Ω, necessitates knowledge of the total free energy of the surface of the structure. These and similar considerations allowed the author to make a number of theoretical predictions regarding the nature and properties of various semiconductors, some of which have been well borne out by the experiment. There are 4 figures, 2 tables and 32 references: 18 Soviet-bloc, 1 Russian translation from non-Soviet authors and 13 non-Soviet-bloc. The 4 most recent references to English language publications read as follows:

4

Ref.17: J.S.Anderson. Proc. Roy. Soc., 1946, 185 A, 69;
Ref.19: Atomic Energy Levels. USA Nat. Bur. Stand. Circ., 1952, 467;
Ref.27: J.Droward, G.de Maria, M.Inghram. J. Chem. Phys., 1958, v.29, 1015.

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S/576/61/000/000/001/020
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The role of the contemporary ...

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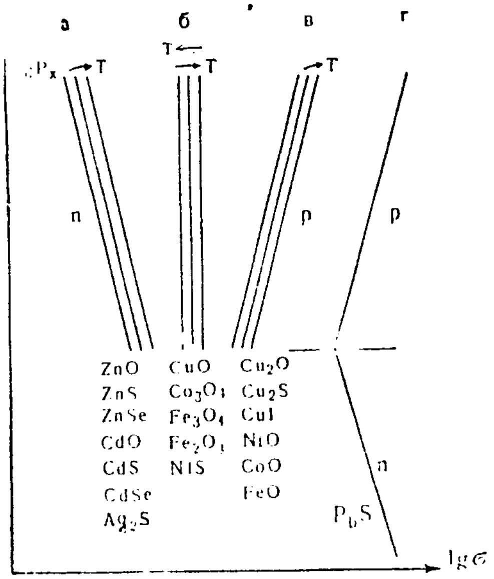

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Fig.1.

S/192/61/002/001/006/006
B107/B218

AUTHORS: Epel'baum, V. A., Sevast'yanov, N. G., Ormont, B. F., and Gurevich, M. A.

TITLE: A possible existence of volume-centered phases of boron carbide and silicon oxycarbide

PERIODICAL: Zhurnal strukturnoy khimii, v. 2, no. 1, 1961, 65

TEXT: It has been stated in Ref. 1 (V. A. Epel'baum, M. A. Gurevich, B. F. Ormont, Zh. neorg. khimii, 1, 2149 (1956)) that lines of a cubic, volume-centered phase occur in preparations of boron carbide, which conclusion was drawn from the reflections of the X-ray picture. This volume-centered phase was called beta phase; it has a period of identity of 3.16 kX. The composition of this phase was not determined. The intensity of the reflections was very high for all samples, for some even higher than that of the reflections of the alpha phase. This led to the assumption that the beta phase belongs to the boron carbon system. The presence of impurities could, however, hardly be excluded, though every attempt was made to remove them (treatment with hydrofluoric and other acids). The authors of Ref. 2 (V. A. Epel'baum, M. A.

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A possible existence ...

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Gurevich, B. F. Ormont, Zh neorg. khimii, 4, 1938, (1959)) found that lines of this volume-centered phase occur in preparations with strongly differing content of boron and carbon Thus, it was not possible to establish the position of the phase in the phase diagram of boron-carbon. This fact led to doubts about the composition of the phase, and thus to further experiments (see below). The authors of Ref 2 had pointed out that spectrum analysis did not show any considerable content of impurities. In 1958, Samsonov had published papers (Ref 3: G V Samsonov, Zh. fiz. khimii, 32, 2424 (1958); Ref. 4: G. V. Samsonov, Ukr khim zh , 24, no. 6, 659 (1958)), in which he stated already in 1952/1953 he had detected this phase in boron carbide, together with Zhuravlev, and found it to be silicon oxycarbide. Despite Samsonov's statement, this fact needs a further proof, especially since silicon oxycarbide is of practical, and the detection of Samsonov and Zhuravlev is of theoretical importance. Hitherto, only cubic silicon carbide and silicon oxycarbide have been known, both only with face-centered cell of the sphalerite type. A system of lines in the X-ray picture, however, corresponds to this structure which completely differs from that of the cubic, volume-centered cell. Thus, Samsonov claims to have detected a new phase of silicon oxycarbide with cubic, volume-centered cell and a period of identity

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B107/B218

A possible existence ...

of 3.16 kX. The authors of the present paper point out that a cubic, volume-centered cell with a period of identity of 3.16 kX leads to certain crystallochemical difficulties, both with boron carbide and silicon oxycarbide. This difficulty lies in the fact that the interatomic distance $d = a\sqrt{3}/2 = 2.85$ kX is larger than the sum of the radii of the individual atoms. In order to explain this fact, it would be necessary to assume the existence of structural centers into which atom impurities enter, or one must assume the existence of complex structural centers with a corresponding system of reflections. The authors therefore arrived at the following conclusion: The system of reflections corresponding to a cubic, volume-centered cell of boron carbide is parasitic; it is formed by the occurrence of an additional phase in the preparation. By their careful experiments and control, the authors found that this admixture is introduced by the tungsten wire which is used for filling the sample to be studied radiographically into the capillary. For the first moment, it was striking that thereby such quantities of impurities could enter into the preparation that their lines are more intense than that of the main mass (Ref. 1). If, however, the great difference of the scattering power of tungsten as compared to boron, silicon, and carbon is considered, then the above effect, which was also observed by

Card 3/4

S/192/61/002/001/006/006
B107/B218

A possible existence ...

the authors of Ref. 2, becomes probable. One may assume that the cubic, volume-centered phase of silicon oxycarbide, which was detected by Samsonov and Zhuravlev (Ref. 3) in 1952, has the same origin. [Abstracter's note: This is a full translation from the original.] There are 4 Soviet-bloc references.

ASSOCIATION: Nauchno-issledovatel'skiy fiziko-khimicheskiy institut im. L. Ya. Karpova (Scientific Research Institute of Physical Chemistry imeni L. Ya. Karpov)

SUBMITTED: January 21, 1960

Card 4/4

29986
S/076/61/035/011/00[illegible]
B110/B147

21 2500

AUTHORS: Zhelankin, V. I., Kutsev, V. S., and Ormont, B. F.

TITLE: Study of the equilibrium in the reduction reaction of [illegible] with carbon at high temperatures. II

PERIODICAL: Zhurnal fizicheskoy khimii, v. 35, no. 11, 1961, 260[illegible]

TEXT: The results of a study of chemical and phase compositions, the calculation of heats and free energies of formation over a wide temperature range are given, and some equilibrium-pressure values of the reaction $HfO_2 + (x-y+2)C = HfC_xO_y + (2-y)CO + Q_p$ (1) are calculated. Four equilibrium preparations corresponding to the conditions of monovariant equilibrium in Eq. (1) were prepared in the temperature range from 1743 to 2003°K. The method had been developed by the authors (Zh. fiz. khimii 33, 1988, 1959). C_{total}, C_{free}(graphite), Hf_{total} and unreacted [illegible] were determined. The graphite content was determined by heating 0.2 to 0.25 g of hafnium oxycarbide with a mixture consisting [illegible] liters of HNO_3 and 1 to 2 milliliters of HF for 15 minutes, and [illegible]

Card 1/4

29986
S/076/61/035/011/[illegible]
B110/B147

Study of the equilibrium ...

off the residue which is burned in O_2 stream. CO_2 is determined by absorption with dry alkali. HfO_2 was determined by keeping the [illegible] with a mixture of chromic and sulfuric acids at 140°C for 1 hr. [illegible] HfO_2 was calcined and weighed, and the oxygen contained in the [illegible] was determined from the difference between total oxygen and TiO_2 [illegible] X-ray analysis was performed after $CuK\alpha_1$ irradiation in an PKУ 86 [illegible] chamber. The lattice constant and the composition of the [illegible] remained constant from 1743 to 2003°K and between 70 and 1000 mm Hg: $HfO_2 + 2.9C \rightleftharpoons HfC_{0.95}O_{0.05} + 1.95\ CO + Q_p$ (2). Free-energy changes Δ [illegible] a function of temperature were calculated from the equation $\Delta G =$ [illegible] It was established that $\Delta S^o_{1750-2000} = 66$ entropy units; $\Delta H_{1750-2000} = 132,300$ cal. The specific heat was calculated from the [illegible] equation: $C_v = 3C_D(\theta/T)$, where $x = \theta/T$. The Lindemann equation $\theta = 135\sqrt{T_f/MV^{2/3}}$ was used to estimate the characteristic temperature [illegible] is the melting temperature of the compound, M is the atomic (molecular) weight, and V = atomic (molecular) volume. It was found that

29986
S/076/61/035/011/009/013
B110/B147

Study of the equilibrium ...

J. Amer. Chem. Soc., 48, 2534, 1926.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physico-chemical Institute imeni L. Ya. Karpov)

SUBMITTED: August 1, 1960

Card 4/4

ZHELANKIN, V.I.; KUTSEV, V.S.; ORMONT, B.F.

Conditions of the formation of hafnium carbide in the reduction of HfO_2 by carbon. Zhur. neorg. khim. 7 no.8: 1762-1764 Ag '62. (MIRA 16:6)

(Hafnium oxide) (Hafnium carbides)

ORMONT, B.F.

Valence of elements, atomization energies, and the chemical bond strength of solids. Zhur. fiz. khim. 36 no.4:836-839 Ap '62. (MIRA 15:6)

1. Fiziko-khimicheskiy institut imeni L.Ya.Karpova.
(Valence (Theoretical chemistry)) (Atomization)
(Chemical bonds)

ORMONT, B.F.

Maximum concentration of vacancies and saturated vapor pressure of simple substances at the melting point. Dokl. AN SSSR 153 no.5:1115-1118 D '63. (MIRA 17:1)

1. Leningradskiy elektrotekhnicheskiy institut im. V.I. Ul'yanova (Lenina). Predstavleno akademikom P.A. Rebinderom.

GOL'DANSKIY, V.I.; KITAYGORODSKIY, I.I., prof.; KOST, A.N., prof.;
LEVICH, V.G.; ORMONT, B.F., prof.; RAZUVAYEV, G.A.;
TAL'ROZE, V.L., prof.; CHERNOV, A.G.; IVANOV, S.M., red.

[Chemistry on new frontiers] Khimiia na novykh rubezhakh. Moskva, Izd-vo "Znanie," 1965. 46 p. (Novoe v zhizni. nauke, tekhnike. XI Seriia: Khimiia, no.2) (MIRA 18:4)

1. Chlen-korrespondent AN SSSR (for Gol'danskiy, Levich, Razuvayev).

ORMONT, Boris Filippovich, doktor khim. nauk, prof.; CHERNIKOVA, V.K., red.

[Physical chemistry of semiconductors] Fizicheskaia khimiia poluprovodnikov. Moskva, Znanie, 1964. 55 p. (Novoe v zhizni, nauke, tekhnike. XI Seriia: Khimiia, no.9)
(MIRA 17:11)

TOPIC TAGS: semiconductor, conductivity measurement, contact method, powdered semiconductor, cadmium sulfide 21 9M

ABSTRACT: A method and apparatus was developed for measuring the electrical conductivity of powdered polycrystalline semiconductors, designed particularly for cadmium sulfide and similar materials, having conductivities of the magnitude $10^{-8} \angle \sigma \angle 10^{-2}$ ohm^{-1}·cm^{-1}. The authors hoped to eliminate errors due to interparticle resistance by extrapolating the measured values to conditions of infinite pressure. The resistance of the sample and of a reference sample was measured under an applied force of $2 \cdot 10^5$ to $2 \cdot 10^7$ newton/m^2 and at 100-100,000 cycles/sec, with the measuring element (see Fig. 1 of the Enclosure) inserted in a furnace to permit tests in an inert gas atmosphere and over a selected temperature range. The

L 34199-65

ACCESSION NR: AP5007622

smaller of the two compared resistances was indicated by a lamp voltmeter, and the specific resistance and conductivity of the test sample were calculated by presented formulas. The calculation of conductivity is illustrated by an example for cadmium sulfide, and the dependence of the electrical conductivity of this compound on temperature is shown. The apparatus can be adapted to measuring the conductivities of single crystals. Orig. art. has: 5 figures and 8 formulas.

ASSOCIATION: Leningradskiy elektrotekhnicheskiy institut im. V. I. Ul'yanova (Lenina) (Leningrad electrotechnical institute)

SUBMITTED: 10Nov64 ENCL: 01 SUB CODE: EM, EC

NO REF SOV: 002 OTHER: 003

Card 2/3

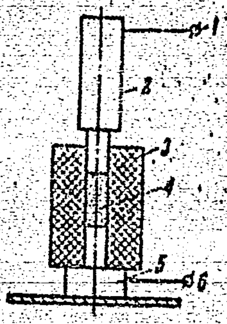

Figure 1. Measuring unit for powdered materials: 1,6-contact cables; 2-upper electrode; 3-ceramic insulator; 4-tested powder; 5-lower electrode.

L 12061-66 EWT(1)/T/EWA(h) IJP(c) AT
ACC NR: AP6001300 SOURCE CODE: UR/0363/65/001/008/1335/1339

44 55 44 55 47

AUTHOR: Godik, E.E.; Ormont, B.F.

44 55 B

ORG: Physicochemical Institute im. Karpov (Fiziko-khimicheskiy institut)

21, 44, 55

TITLE: Method of diffuse-reflection spectra in the phase analysis of semiconductor systems

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 1, no. 8, 1965, 1335-1339

TOPIC TAGS: forbidden zone width, light reflection, zinc compound, selenide, cadmium selenide, semiconducting material

ABSTRACT: To determine how sensitive the spectral curve of diffuse reflection is to the appearance of a new phase, the pseudobinary system ZnSe-CdSe was studied as an example. The method permitted the determination of one of the most basic characteristics of semiconductor phases, i.e., the forbidden gap width ΔE_{phot}. The study made it possible to investigate the kinetics and mechanism of phase interaction producing solid solutions, and in particular their homogenization. The effect of various experimental factors on the sensitivity of the method was determined: the optimum thickness of the layer of ZnSe

21, 44 55

Card 1/2 UDC: 537.311.33

L 12061-66
ACC NR: AP6001300

0

(containing 1% CdSe) is 5 mg/cm^2; the sensitivity increases with decreasing particle size; reflection from a white substrate leads to secondary passage of light through the layer of the substance studied, causing an increase in sensitivity. The diffuse-reflection method is simple, rapid (the analysis lasts only 5 to 10 min), and accurate. Orig. art. has: 7 figures.

SUB CODE: 11,20 / SUBM DATE: 25Mar65 / ORIG REF: 004/ OTH REF: 002

8C

Card 2/2

L 16808-66 EWT(1)/EWT(m)/EPF(n)-2/EWP(t) IJP(c) JD/WW/JG
ACC NR: AP6003365 (A) SOURCE CODE: UR/0363/66/002/001/0070/0073

AUTHOR: Tess, D.; Ormont, B.F. 59

B

ORG: Leningrad Electrical Engineering Institute im. V.I. Ul'yanov (Lenin) (Leningradskiy elektrotekhnicheskiy institut)

TITLE: Effect of heat treatment of cadmium sulfide powder in sulfur and cadmium vapor on its electrical conductivity 21 27 18 16

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 2, no. 1, 1966, 70-73

TOPIC TAGS: cadmium sulfide, electric conductivity, sulfur, cadmium

21,44,55

ABSTRACT: The aim of the study was an experimental determination of the dependence of the electrical conductivity σ, and subsequently other electrophysical and optical properties of cadmium sulfide CdS_x, on the conditions of heat treatment in sulfur and cadmium vapor at 1020, 900, and 800C. Powders as well as films and single crystals of cadmium sulfide were studied. To achieve reproducible results, steps were taken to prevent oxygen from reaching the samples. A reproducible dependence of log p_{S_2} on log σ was obtained for CdS_x powder; it was found to be linear over a wide range. A linear dependence of log p_{S_2} on the reciprocal temperature was also obtained under conditions

Card 1/2 UDC: 546.48'221

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ACC NR: AP6003365

of bivariant equilibrium for log σ = const. The shape of the curves indicates that all the samples have a certain excess of cadmium; this is associated with the formation of a corresponding quantity of sulfur vacancies, which act as donor levels, in the sulfur sublattice. All the samples had n-type conductivity. Orig. art. has: 4 figures.

SUB CODE: 11, 20 / SUBM DATE: 01Mar65 / ORIG REF: 006 / OTH REF: 009

Card 2/2 mc

ACC NR: AP7006208 SOURCE CODE: UR/0363/67/003/001/0167/0168

AUTHOR: Tess, D.; Ormont, B. F.

ORG: Physical Chemistry Department, Leningrad Electrical Engineering Institute im. V. I. Ul'yanov (Lenin) (Kafedra fizicheskoy khimii, Leningradskiy elektrotekhnicheskiy institut)

TITLE: Effect of thermal treatment of cadmium sulfide powder in sulfur and cadmium vapors on its electrical conductivity

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 3, no. 1, 1967, 167-168

TOPIC TAGS: cadmium sulfide, sulfur, cadmium, semiconductor conductivity

ABSTRACT: The authors discuss the theoretical implications of their experimental work (D. Tess and B. F. Ormont, Zh. Neorgan. Materialy 2, 70, 1966), in which the electrical conductivity of undoped cadmium sulfide crystals was changed by ten orders of magnitude by changing the pressure of sulfur also by about ten orders of magnitude. The failure of attempts to obtain reproducible results for the relationship $\log \sigma = f(\log P_{Cd})$ on undoped samples because of the vacancy mechanism of conduction has been a serious gap and impediment to the further development of semiconductor theory. The extent to which the experimental results cited above fill this gap is described. Since a reproducible change of the electrical conductivity of cadmium sulfide was successfully obtained by the authors on polycrystalline powders with changing pressure of the components during the synthesis, whereas this could not be achieved on single-crystal samples by other authors, it is concluded that experiments on semiconducting

Card 1/2 UDC: 546.48'221:537.311

ACC NR: AP7006208

compounds should be carried out on both polycrystalline and single-crystal samples. The studies discussed permit one to obtain a clear picture of the thermodynamic conditions of the synthesis of cadmium sulfide, whatever its electrical conductivity and other desired properties.

SUB CODE: 20/ SUBM DATE: 28Jan66/ ORIG REF: 010/ OTH REF: 005

Card 2/2

15-1957-10-13900

Translation from: Referativnyy zhurnal, Geologiya, 1957, Nr 10, p 74 (USSR)

AUTHOR: Ormont, N. N.

TITLE: Pyroxenes in the Basaltic Rocks of the Mokraya Volnovakha River Basin and the Distribution of Iron in These Rocks (Pirokseny bazal'tovykh porod basseyna r. Mokraya Volnovakha i raspredeleniye zheleza v etikh porodakh)

PERIODICAL: Vestn. Mosk. un-ta, 1956, Nr 1, pp 95-106

ABSTRACT: Samples of pyroxene from the basalts of the Kamyshevakha Ravine, in the Ukraine, were crushed and cleaned of impurities; a table of the chemical composition of the pyroxenes and of the parent rocks is given. Tables are also given for spectral data on the pyroxenes and the parent rock and for the optical properties of the pyroxenes. These are accompanied by petrographic descriptions of the rocks. The author concludes that the pyroxene is titanaugite of complex composition, with considerable quantities of isomorphous admixtures; that

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15-1957-10-13900

Pyroxenes in the Basaltic Rocks of the Mokraya Volnovakha River Basin and the Distribution of Iron in These Rocks

during crystallization from the melt, most of the iron was used in making magnetite and titaniferous magnetite, some went into olivine, and a very small quantity was taken up by pyroxene; and that the chemical compositions and optical properties of the various pyroxene phenocrysts are similar.

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15-1957-10-13900

Pyroxenes in the Basaltic Rocks of the Mokraya Volnovakha River Basin and the Distribution of Iron in These Rocks

Components	I	Ia	III	IIIa	VI	VIa	VIII	VIIIa
SiO_2	40.72	46.78	42.18	44.94	43.80	46.85	45.99	45.04
TiO_2	8.44	3.96	8.97	4.38	7.21	4.50	6.58	5.68
Al_2O_3	8.10	3.91	8.42	4.38	9.55	4.04	13.92	4.38
Cr_2O_3	0.03	undet	tr.	--	tr.	--	tr.	--
Fe_2O_3	8.66	2.70	9.26	6.36	6.87	3.63	6.26	4.09
FeO	7.36	6.00	7.26	4.21	8.45	6.12	5.42	5.97
MnO	0.17	0.14	0.33	0.24	0.22	0.17	0.21	0.19
MgO	6.73	14.46	7.02	13.25	7.46	13.55	5.52	13.26

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15-1957-10-13900

Pyroxenes in the Basaltic Rocks of the Mokraya Volnovakha River Basin and the Distribution of Iron in These Rocks

CaO	13.24	21.06	12.58	21.68	12.36	20.45	8.36	20.10
Na_2O	1.60	0.62	1.30	0.27	1.67	0.54	2.16	0.46
K_2O	1.80	0.20	1.93	0.25	1.25	0.05	2.59	0.41
V_2O_5	0.12	undet	0.11	undet	0.13	--	0.08	--
P_2O_5	0.26	undet	--	undet	0.23	--	0.05	--
F	--	--	--	undet	--	--	--	--
S	1.78	undet	0.01	--	0.02	--	--	--
H_2O	0.40	0.20	0.30	--	0.38	0.10	0.55	0.44

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Pyroxenes in the Basaltic Rocks of the Mokraya Volnovakha River Basin and the Distribution of Iron in These Rocks 15-1957-10-13900

others	1.12	0.44	0.72	--	1.06	0.44	2.29	0.46
Total	100.53	100.47	100.39	99.96	100.66	200.44	99.98	100.48

I, III, VI--basalts; VIII--basalt porphyrite; Ia, IIIa, VIa--pyroxenes from the basalts; VIIIa--pyroxene from the basalt porphyrite.

Card 5/5

S. P. Bryzgalina

ORMONT, N.N.; BATANOVA, A.M.

Petrographic investigation of the ralation between the structure of cast stone and the conditions of crystallization at the Moscow Stone Casting Plant. Vest.Mosk.un.Ser.biol., pochv., geol.,goeg. 13 no.3: 163-171 '58. (MIRA 12:1)

1. Kafedra petrografii Moskovskogo gos. universiteta.
(Moscow--Stone, Cast)

BATANOVA, A.M.; ORMONT, N.N.

Skeleton forms of some silicates and their connection with structure.
Vest.Mosk.un.Ser.4: Geol. 19 no.5:70-80 S-O '64.
(MIRA 17:12)

1. Kafedra petrografii Moskovskogo universiteta.

L 23150-66 EWT(m)/EWP(t) IJP(c) JD
ACC NR: AP6006844 SOURCE CODE: UR/0181/66/008/002/0546/0551

84
B

AUTHOR: Ormont, A. B.; Poltoratskiy, E. A.; Yunovich, A. E.

ORG: Moscow State University im. M. V. Lomonosov (Moskovskiy gosudarstvennyy universitet)

TITLE: Low-current radiative recombination at *pn* junctions in gallium arsenide

27 27

SOURCE: Fizika tverdogo tela, v. 8, no. 2, 1966, 546-551

TOPIC TAGS: semiconductor diode, gallium arsenide, radiative recombination, beryllium, zinc, pn junction, emission spectrum, metal diffusion

ABSTRACT: The authors compared emission spectra at *pn* junctions in gallium arsenide produced by diffusion of beryllium and zinc into the *n*-GaAs with a donor concentration of 10^{16} to $3 \cdot 10^{18}$ cm^{-3}. The measurements were made at temperatures of 77, 188 and 293°K and current densities of 0.1-30 a/cm^2. The emission spectra at 77°K showed maxima with energies of 1.0, 1.3 and 1.47 ev. The positions and intensities of these maxima depend on the dopant concentration in the initial material and the method used for producing the *pn* junction. The energy position of the shortwave

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ACC NR: AP6006844

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peak is a linear function of the applied voltage in the 1.25-1.47 v range for impurity concentrations of more than $8 \cdot 10^{17}$ cm^{-3} at a temperature of 77°K. A relationship is found between the emission spectra and current voltage characteristics of the diodes. The authors are grateful to V. L. Bonch-Bruyevich for discussing the results, to V. S. Vavilov, for interest in the work, and V. M. Stuchebikov for assistance with the experiments. Orig. art. has: 4 figures.

SUB CODE: 20, 09/ SUBM DATE: 16Jun65/ ORIG REF: 009/ OTH REF: 010

Card 2/2 0VR

L 16350-65 EWT(l)/ EWG(k)/EWT(m)/EEC(t)/EWP(t)/EWP(b) Pz-6 IJP(c)/
ESD(t)/ESD(gs)/SSD/BSD/AFWL/AS(mp)-2 JD/AT

ACCESSION NR: AP5000673 S/0181/64/006/012/3708/3710

AUTHORS: Kurova, I. A.; Ormont, N. N.

B

TITLE: Concerning the spectra of impurity conductivity of germanium doped with gold, at low temperatures

SOURCE: Fizika tverdogo tela, v. 6, no. 12, 1964, 3708-3710

TOPIC TAGS: germanium, impurity conductivity, photoconductivity, phosphorescence, photoconductivity spectrum

ABSTRACT: The samples investigated were n-type germanium with an upper gold acceptor level E_c - 0.042 eV, partially compensated with antimony, and p-type with a donor level + 0.041 eV partially compensated with gallium. The spectra were measured with an IKS-21 instrument in the wavelength region 3--22 μ and at sample temperature 7--35K. The results showed that with decreasing temperature the photoresponse peak shifted towards the longer wavelengths. At

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L 16350-65

2

ACCESSION NR: AP5000677

7K the photoconductivity spectrum of germanium doped with gold is similar to the photoconductivity spectrum of germanium alloyed with antimony only. This is attributed to charge exchange of the antimony and gold levels at low temperatures. In the case of p-type germanium oscillations are observed in the photoconductivity spectra, with the depths of the minima decreasing with increasing temperature. Further research is necessary to clarify the nature of the oscillations. "The authors are grateful to Professor S. G. Kalashnikov for a discussion of the results." Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Moskovskiy gosudarstvenny*y universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 03Jul64

ENCL: 00

SUB CODE: SS, EM

NR REF SOV: 002

OTHER: 006

Card 2/2

L 2261-66 EWT(m)/EWP(t)/EWP(b) IJP(c) JD

ACCESSION NR: AP5006920 S/0181/65/007/003/0940/0941 23 22 B

AUTHOR: Kurova, I. A.; Ostroborodova, V. V.; Ormont, N. N.

TITLE: Voltage sensitivity of p-type germanium with gold at low temperatures 18

SOURCE: Fizika tverdogo tela, v. 7, no. 3, 1965, 940-941 27

TOPIC TAGS: germanium, voltage sensitivity, donor level, photoionization, low temperature research

ABSTRACT: The integral voltage sensitivity of p-type germanium samples with partially compensated donor level of gold was measured in a metallic helium cryostat. The sample was fastened on a cold finger together with a heater and its temperature could be varied between 10 and 50K. The source of radiation was a copper cylinder with heater, and radiation from which was modulated at 400 cps. The voltage from the sample was displayed on an oscilloscope and measured with a meter after amplification. The temperature dependence of the voltage sensitivity is illustrated in Fig. 1 of the Enclosure. The activation energy was ~0.04 eV, and the ionization energy of the donor level was 0.041 eV. The temperature dependence of the voltage sensitivity was thus in agreement with the theory of impurity photoconductivity in the presence of one impurity level. The voltage sensitivity was also independent

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L 2261-66

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ACCESSION NR: AP5006920

of the degree of compensation of the level and of the impurity concentration. A value of (1.16--08) x 10^{16} cm^2 was obtained for the average effective photoionization cross section of the level, in agreement with data obtained by others. Orig. article has: 1 figure, 2 formulas, and 1 table.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 11Jun64

ENCL: 01

SUB CODE: SS, TD

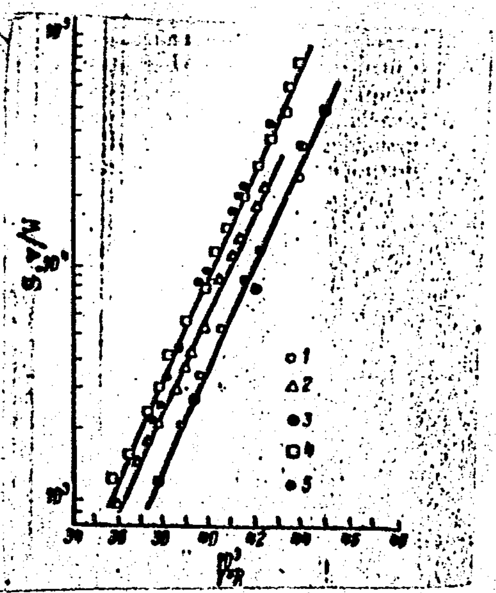
NR REF SOV: 004

OTHER: 001

Card 2/2

L 2261-66

ACCESSION NR: AP5006920



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ENC. 01

Dependence of the integral voltage sensitivity on the temperature.

Symbol number:
1. 2078
2. 1641
3. 1033
4. 1431

dg

Card 3/3

L 64773-65 EWT(m)/EWP(b)/EWP(t) IJP(c) JD

ACCESSION NR: AP5016550 UR/0056/65/048/006/1588/1593

34
30
B

AUTHORS: Besfamil'naya, V.A.; Kurova, I.A.; Ormont, N.N.; Ostroborodova, V.V.

TITLE: Oscillations in the impurity conductivity spectra of germanium

21

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 48, no. 6, 1965, 1588-1593

TOPIC TAGS: germanium, impurity conductivity, photoconductivity, spectrum analysis

ABSTRACT: This is a continuation of earlier studies and experiments by the authors (FTT v. 6, 3708, 1964) and by others, and its purpose was to examine in greater detail the oscillations of the impurity

carried out at 8--14K on samples with partly compensated levels of

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L 64773-65

ACCESSION NR: AP5016550

copper at 0.041 eV, of gold at 0.041 eV, of zinc at 0.03 eV, and of cadmium at 0.05 eV. The study included comparison of the photoconductivity and absorption spectra, comparison of the photoconductivity spectra of samples having different concentrations of impurity centers, recombination centers, and scattering centers, and investigation of the effect in crystals gation of the effect in crystals containing different impurities. Phosphorus, gallium, and antimony were used for counter-alloying. The impurity concentration, the number of recombination and scattering centers, and the carrier mobility and its temperature dependence were determined from measurements of the Hall coefficient and the electric resistivity in the temperature range 300--6K. It was found that the depth of oscillations was different for different samples, and that in some cases there were no oscillations at all. No oscillation effect was observed in the absorption spectra. The oscillation depth of the photoconductivity spectra was compared with the photoelectric properties of the samples. A correlation was found between the relative depth of oscillations and the recombination-center

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4 figures and 1 table.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University)

SUBMITTED: 18Jan65 ENCL: 00 SUB CODE: SS

NR REF SOV: 006 OTHER: 008

KC

Card 3/3

L 02197-67 EWT(1)/EWT(m)/EWP(t)/ETI IJP(c) JD/HW/JG/AT

ACC NR: AP6031432 SOURCE CODE: UR/0056/66/051/002/0401/0405

AUTHOR: Kurova, I. A.; Ormont, N. N.; Ostroborodova, V. V. 85 B

ORG: Moscow State University (Moskovskiy gosudarstvennyy universitet)

TITLE: Impurity photoconductivity spectra of p-type germanium with Ga, Hg, Au, and Ni impurities at low temperatures 27 16

SOURCE: Zh eksper i teor fiz, v. 51, no. 2, 1966, 401-405

TOPIC TAGS: impurity conductivity, photoconductivity, germanium, p type germanium, recombination, impurity center, ion energy

ABSTRACT: The impurity photoconductivity spectra of p-type germanium with partially compensated levels of Ga (0.01 ev), Hg (0.098 ev), Au (0.15 ev), and Ni (0.2 ev) were investigated at temperatures of 6—10K. Oscillations, i.e., a set of equidistant (0.037 ev) minimums, are observed in the Ge with Ga spectra. The relative depth of the minimums (K, %) depends on the lifetime of the holes τ_0 in the sample, decreasing as the lifetime increases. The dependence of K on the field strength and temperature agrees qualitatively with the respective dependence of τ_0. The depth of minimums in the photoconductivity spectra of Ge with Hg is much less than that of Ge with Ga at the same

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L 02197-67

ACC NR: AP6031432

concentrations of recombination centers. No oscillations are observed in Ge spectra with Au or Ni. The results obtained together with those of a previous paper (B. A. Besfamil'naya, I. A. Kurova, N. N. Ormont, V. V. Ostroborodova, ZhETF, 48, 1588, 1965) indicate that for equal lifetimes, the oscillation depth decreases with the growth of the ionization energy of the impurity centers. Some suggestions are made regarding the possible causes of the effect. Orig. art. has: 5 figures and 1 table. [Based on authors' abstract] [NT]

SUB CODE: 20/ SUBM DATE: 02Mar66/ ORIG REF: 007/ OTH REF: 01

Card 2/2

ORMONTOWICZ, L.

2

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677. PARAMETER EQUATIONS OF SPIRAL CAPACITOR COILS.

L. Ormontowicz.

Przeglad telekom., 1955, No. 12, 409-15. In Polish.

An equation to establish the relation between fundamental parameters of a capacitor coil and the length of Archimedes spiral is derived. Nomograms are given by means of which the required number of turns may be determined in a simple manner, for the desired value of capacity.

Polish Technical Abstracts

ORMOS, E.

Hungary (USSR)/Medicine - Transplantation of Arteries Oct 53

"Preservation and transplantation of Arteries," L. Sin, D. Berci, D. Gal
E. Ormos, Surgical Clinic and Inst of Pathol, Szeged U

Khirurg, No 10, pp 70-75

Describes the procedure and histological aspects of aorta transplantation in animals. The tissues were preserved in a mixt similar to Tirode's soln and contg glucose, 10% of plasma, and buffer compds. Retrograde arteriograms of the 9 survivors from the 26 animals used in the expt showed a complete adjustment of the transplant. Similar transplants were made in humans. Human tissues were removed from persons who died from non-septic or non-malignant causes, and preserved for as long as 75 days. In human transplants, the solution for preserving was the same as described above but the blood plasma used for preservation matched the blood type of the donor. Authors advised that further research is in progress in this field. They suggest that every large medical institution keep a supply of preserved material, and have a staff qualified to perform transplantations.

L 34216-66 RM/DS

ACC NR: AP6026090 SOURCE CODE: HU/0014/66/000/003/0138/0140

23
B

AUTHOR: Bujdoso, Erno (Doctor); Miskei, Mihaly; Ormos, Gyorgy

ORG: Research Institute for the Metal Industry, Budapest (Femipari Kutato Intezet)

19

TITLE: Purification of radioactive isotope Zn-65 with ion-exchange chromatography 1

SOURCE: Kohaszati lapok, no. 3, 1966, 138-140

TOPIC TAGS: zinc, isotope, ion exchange chromatography, gamma spectrum, chemical purity

ABSTRACT: Experiments for the purification of radioactive zinc isotope
Zn-65 samples with 197, 210, and 185 mC./g. specific activity in 0.2
mg./ml. concentration (in 8 M HCl) by ion-exchange chromatography were
described. The column employed was 160 mm. long and had a diameter of
10 mm. It was packed with Varion AP polystyrene-base ion-exchange resin 1
of a particle size of 0.063-0.2 mm. (1.3 mval./ml.). The eluent was 20-40
ml. 8 M HCl, containing 5-10 mg. active zinc, 6 mg. cobalt, and 6 mg.
silver carrier. Ion-exchange chromatograms and gamma-ray spectra for the
purified product were presented and discussed to illustrate the effective-
ness of the procedure. The product was radiochemically pure. A relative
enrichment of Co-60 was noted. Orig. art. has: 5 figures and 2 tables. [JPRS:
36,646]

SUB CODE: 07, 18, 20 / SUBM DATE: none / ORIG REF: 009 / SOV REF: 001

OTH REF: 002 82 UDC: 54.02:661.183.1:542.949:545.844

Card 1/1

0916 1118

BUJDOSO, Erno, dr.; MISKEI, Mihaly; ORMOS, Gyorgy

Examination of the behavior of zinc by radioactive isotopes during the stirring process of aluminate lyes. Koh lap 97 no.3:146-148 Mr'64

1. Femipari Kutato Intezet, Budapest.

BUJDOSO, Erno, dr., MICKE, Mihaly; GOMOS, Gyorgy

Testing the continuous precipitation of aluminate lye by radioactive isotopes. Koh lap 97 no.9:419-422 S '64.

1. Research Institute of the Metal Industry, Budapest.